Electronic Version
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Claims

[c1] What is claimed is:

1. A punch for making a plurality of openings comprising:

a frame having a length in a first direction;

a plurality of punch blocks, each punch block fixed in the frame in the first direction and moveable in the frame in a second direction perpendicular to the first direction, each punch block comprising:

a first guide surface facing opposite the second direction, the first guide surface spanning from one end of the punch block to the other end along the first direction and being further in the second direction at the two ends of the punch block than at the middle of the punch block;

at least a punch head facing the second direction;

a retracting mechanism for urging the punch block in opposite the second direction to an initial position;

a slider movable along the frame in the first direction;

a protrusion connected to the slider at a position to engage the first guide surface of each punch block;

wherein when the slider moves in the first direction along the frame, the protrusion pushes the first guide

surface near the middle of the punch block moving the punch block in the second direction.

[c2] 2. The punch of claim 1 wherein the retracting mechanism comprises a second guide surface facing and separated from the first guide surface and of shape substantially mating with the first guide surface; wherein when the slider moves in the first direction along the frame, the protrusion pushes the second guide surface near an end of a punch block moving the punch block in opposite the second direction to the initial position.

[c3] 3. The punch of claim 2 wherein the retracting mechanism further comprises a pin protruding from the punch block engaging with a slot formed in the frame, the slot being substantially in the second direction and having with a constriction offering resistance to translation of the pin to hold the punch block at the initial position when the protrusion is not pushing the first guide surface.

[c4] 4. The punch of claim 2 wherein the retracting mechanism further comprises a slot formed in the punch block engaging with a pin protruding from the frame, the slot being substantially in the second direction and having with a constriction offering resistance to translation of the pin to hold the punch block at the initial position

when the protrusion is not pushing the first guide surface.

[c5] 5. The punch of claim 2 wherein each punch block is substantially symmetrical about a plane formed by the first and second directions, each punch block having two first and second surfaces; the punch comprising two protrusions, one for pushing each set of first and second guide surfaces.

[c6] 6. The punch of claim 1 wherein the retracting mechanism comprises an elastic member connecting the punch block to the frame.

[c7] 7. The punch of claim 6 wherein the elastic member is a flat spring or a coil spring.

[c8] 8. The punch of claim 1 further comprising a base connected to both ends of the frame, a gap between the base and the frame for accommodating material to be cut by the punch heads.

[c9] 9. The punch of claim 1 wherein the protrusion is a roller rotationally connected to the slider.

[c10] 10. A punch for making a plurality of openings comprising:
a frame having a length in a first direction;

a plurality of punch blocks, each punch block fixed in the frame in the first direction and moveable in the frame in a second direction perpendicular to the first direction, each punch block comprising:

a guide groove spanning from one end of the punch block to the other end along the first direction and being further in the second direction at the two ends of the punch block than at the middle of the punch block;

at least a punch head facing the second direction;

a pin protruding from the punch block;

a slider movable along the frame in the first direction;

a roller connected to the slider at a position to engage the guide groove of each punch block;

a plurality of slots formed in the frame, each slot being substantially in the second direction and having with a constriction offering resistance to translation of the pin to hold the punch block at an initial position when the roller is not pushing the guide groove near the middle of the punch block; and

a base connected to both ends of the frame, a gap between the base and the frame for accommodating material to be cut by the punch heads;

wherein when the slider moves in the first direction along the frame, the roller pushes the guide grove near the middle of the punch block moving the punch block in the second direction, and pushes the guide grove near

the ends of the punch block moving the punch block in opposite the second direction.

[c11] 11. The punch of claim 10 wherein each punch block is substantially symmetrical about a plane formed by the first and second directions, each punch block having two guide grooves; the punch comprising two rollers, one for engaging each of the guide grooves.

[c12] 12. The punch of claim 11 wherein each punch block comprises four pins and the frame comprises four corresponding slots per punch block.

[c13] 13. A punch for making a plurality of openings comprising:
a frame having a length in a first direction;
a plurality of punch blocks, each punch block fixed in the frame in the first direction and moveable in the frame in a second direction perpendicular to the first direction, each punch block comprising:
a means for receiving an actuation in the second direction;
at least a punch head facing the second direction;
a means for retracting the punch block in opposite the second direction to an initial position;
a means for engaging the means for the means for receiving an actuation for urging each punch block in the

second direction.

[c14] 14. The punch of claim 13 wherein each punch block is substantially symmetrical about a plane formed by the first and second directions.

[c15] 15. The punch of claim 13 further comprising a base connected to both ends of the frame, a gap between the base and the frame for accommodating material to be cut by the punch heads.